

What is Claimed is:

1. A transparent oxide electrode film having indium oxide containing titanium as its main component, wherein indium in said indium oxide is substituted with titanium at a titanium/indium atomic ratio between 0.003 and 0.120, said indium oxide is crystalline, and the resistivity of said transparent oxide electrode film is up to $5.7 \times 10^4 \Omega\text{cm}$.
2. A transparent oxide electrode film according to claim 1, wherein said titanium/indium atomic ratio is between 0.003 and 0.050, and the resistivity of said transparent oxide electrode film is up to $4.0 \times 10^4 \Omega\text{cm}$.
3. A transparent oxide electrode film according to either one of claim 1 and claim 2, wherein the average light transmittance for wavelengths between 1000 nm and 1400 nm is at least 60%.
4. A transparent oxide electrode film according to any one of claim 1 through claim 3, wherein the carrier electron concentration given by Hall effect measurement is up to $5.5 \times 10^{20} \text{ cm}^{-3}$.
5. A transparent oxide electrode film according to claim 4, wherein the carrier electron concentration given by Hall effect measurement is up to $4.0 \times 10^{20} \text{ cm}^{-3}$.
6. A transparent oxide electrode film according to any one of claim 1 through claim 5, wherein the carrier electron mobility given by Hall effect

measurement is at least 40 cm²/Vsec.

7. A transparent oxide electrode film according to claim 6, wherein the carrier electron mobility given by Hall effect measurement is at least 60 cm²/Vsec.

8. A transparent oxide electrode film according to claim 6, wherein the carrier electron mobility given by Hall effect measurement is at least 70 cm²/Vsec.

9. A transparent oxide electrode film having indium oxide containing titanium and tungsten as its main component, wherein indium in said indium oxide is substituted with titanium and tungsten at a ratio which when the titanium/indium atomic ratio is deemed x and the tungsten/indium atomic ratio is deemed y, satisfies an equation (1),

$$0.019 - 1.90x \leq y \leq 0.034 - 0.28x \quad (1)$$

and wherein said indium oxide is crystalline, and the resistivity is up to $5.7 \times 10^4 \Omega\text{cm}$.

10. A transparent oxide electrode film according to claim 9, wherein when the titanium/indium atomic ratio is deemed x and the tungsten/indium atomic ratio is deemed y, said ratio satisfies an equation (2)

$$0.019 - 1.27x \leq y \leq 0.034 - 0.68x \quad (2)$$

and wherein said resistivity is up to $3.8 \times 10^4 \Omega\text{cm}$.

11. A transparent oxide electrode film according to either one of claim 9 and claim 10, wherein the average light transmittance for wavelengths between 1000 nm and 1400 nm is at least 60%.
12. A transparent oxide electrode film according to any one of claim 9 to claim 11, wherein the carrier electron concentration given by Hall effect measurement is up to $5.5 \times 10^{20} \text{ cm}^{-3}$.
13. A transparent oxide electrode film according to claim 12, wherein the carrier electron concentration given by Hall effect measurement is up to $4.0 \times 10^{20} \text{ cm}^{-3}$.
14. A transparent oxide electrode film according to any one of claim 9 through claim 13, wherein the carrier electron mobility given by Hall effect measurement is at least $40 \text{ cm}^2/\text{Vsec}$.
15. A transparent oxide electrode film according to claim 14, wherein the carrier electron mobility given by Hall effect measurement is at least $60 \text{ cm}^2/\text{Vsec}$.
16. A transparent oxide electrode film according to claim 15, wherein the carrier electron mobility given by Hall effect measurement is at least $70 \text{ cm}^2/\text{Vsec}$.
17. A manufacturing method for a transparent oxide electrode film according to any one of claim 1 through claim 16, wherein said transparent

oxide electrode film is deposited by a sputtering method using either a sputtering target manufactured from an oxide sintered body for which the constituent elements are substantially indium, titanium and oxygen, or a sputtering target manufactured from an oxide sintered body for which the constituent elements are substantially indium, titanium, tungsten and oxygen, at a substrate temperature of at least 100°C, using a mixed gas of argon and oxygen containing at least 0.25% oxygen as the sputtering gas.

18. A transparent electroconductive base material, wherein a transparent oxide electrode film according to any one of claim 1 through 16 is formed on a transparent substrate.

19. A transparent electroconductive base material of Claim 18, wherein the average light transmittance in the wave length range from 1000 nm to 1400 nm is at least 60%, and wherein the surface resistance is up to 30 Ω/\square .

20. A solar cell, which uses a transparent oxide electrode film according to any one of claim 1 through 16.

21. A solar cell according to claim 19 having a sequentially layered construction comprising either one of a substrate on which an electrode layer is provided and a conductive metal substrate, and further comprising a light absorbing layer of a p-type semiconductor provided on said substrate, a middle layer of an n-type semiconductor provided on said light absorbing layer, a

window layer of a semiconductor provided on said middle layer, and an n-type transparent electrode layer provided on said window layer, wherein a transparent oxide electrode film according to any one of claim 1 to claim 16 is used as said transparent electrode layer.

22. A solar cell according to claim 20 having a sequentially layered construction comprising a transparent electrode layer provided on a transparent substrate, a window layer of a semiconductor provided on said transparent electrode layer, a middle layer of an n-type semiconductor provided on said window layer, and a light absorbing layer of a p-type semiconductor provided on said middle layer, wherein a transparent oxide electrode film according to any one of claim 1 to claim 16 is used as said transparent electrode layer.

23. A solar cell according to either one of claim 21 and claim 22, wherein said light absorbing layer is at least one member selected from the group of CuInSe₂, CuInS₂, CuGaSe₂, CuGaS₂ and a solid solution of these compounds, and CdTe.

24. A solar cell according to any one of claim 21 through claim 23, wherein said middle layer is either one of a solution precipitated CdS layer and a (Cd, Zn) S layer.

25. A solar cell according to any one of claim 21 through claim 24, wherein said window layer is either one of ZnO and (Zn, Mg) O.

26. A photo detection element comprising a pair of electrodes and a layer of photo detection materials interposed between the said electrodes, wherein the transparent oxide electrode film according to any one of claim 1 through claim 16 is used as at least one of the said electrodes.

27. A photo detection element according to claim 26, wherein the said layer of photo detection materials is a layer of infrared light detection materials and the photo detection element is for detecting infrared light.